GROWTH OF RELIC HEMLOCK IN NORTHEASTERN OHIO

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The hemlock, *Tsuga canadensis* (L.) Carr., is a climax dominant in the forests of the upper Great Lakes Region, New England, and parts of the Appalachians. It also occurs in small, disjunct, relic colonies which are isolated from the climax range of the species. Several studies on the growth of hemlock have been made within its climax range by determining age-diameter relationships (Gates and Nichols, 1930; Morey, 1936; Oosting and Bourdeau, 1955), but no comprehensive study of this kind has been accomplished in a relic colony. In order to determine whether or not the growth of hemlock in relic colonies is comparable to that in the climax range, the following study was initiated.

Two stands were studied in Summit County, Ohio. One was at Sand Run Park on steep, sandy ravines; the other was at Kendall Park on sandstone ledges. Sand Run Park lies on the northern city limit of Akron, and Kendall Park is 7 miles northeast of Sand Run Park. The nearest extension of the climax range of hemlock is about 79 miles to the northeast (Braun, 1950). Both areas were lumbered about 1880 and now support mature, second-growth hemlock-hardwood stands in which seedlings and saplings occur.

The height, diameter at breast height (including the bark), and age, as determined by counting annual rings from increment cores taken at breast height, were determined for 212 trees: 117 at Kendall Park and 95 at Sand Run Park. Measurements of trees with more than a little heart rot and of trees severely damaged by topping were excluded from the data. The ages of a few trees in excess of 20 inches in diameter could not be determined because of the inadequate length of the increment borer.

Growth in diameter of ⅜ in. per year was found in many trees; however, the extremes were from ⅜ in. in 26 years. to 1¼ in. in 1 year. Slow growth was characteristic of certain trees during various years but not of all such trees during the same years. Many trees had groups of narrow rings, which often abruptly alternated with groups of wider rings. Such variations in growth probably reflect either topping or various degrees of shading rather than climatic fluctuations.

The age-diameter and age-height relationships respectively of hemlocks in both parks are shown in Figures 1 and 2. All data were combined for these figures, because the growth at both parks was similar. The wide variation in growth for any age-class could not be correlated with soil type, texture, or humus content near each tree, the exposure

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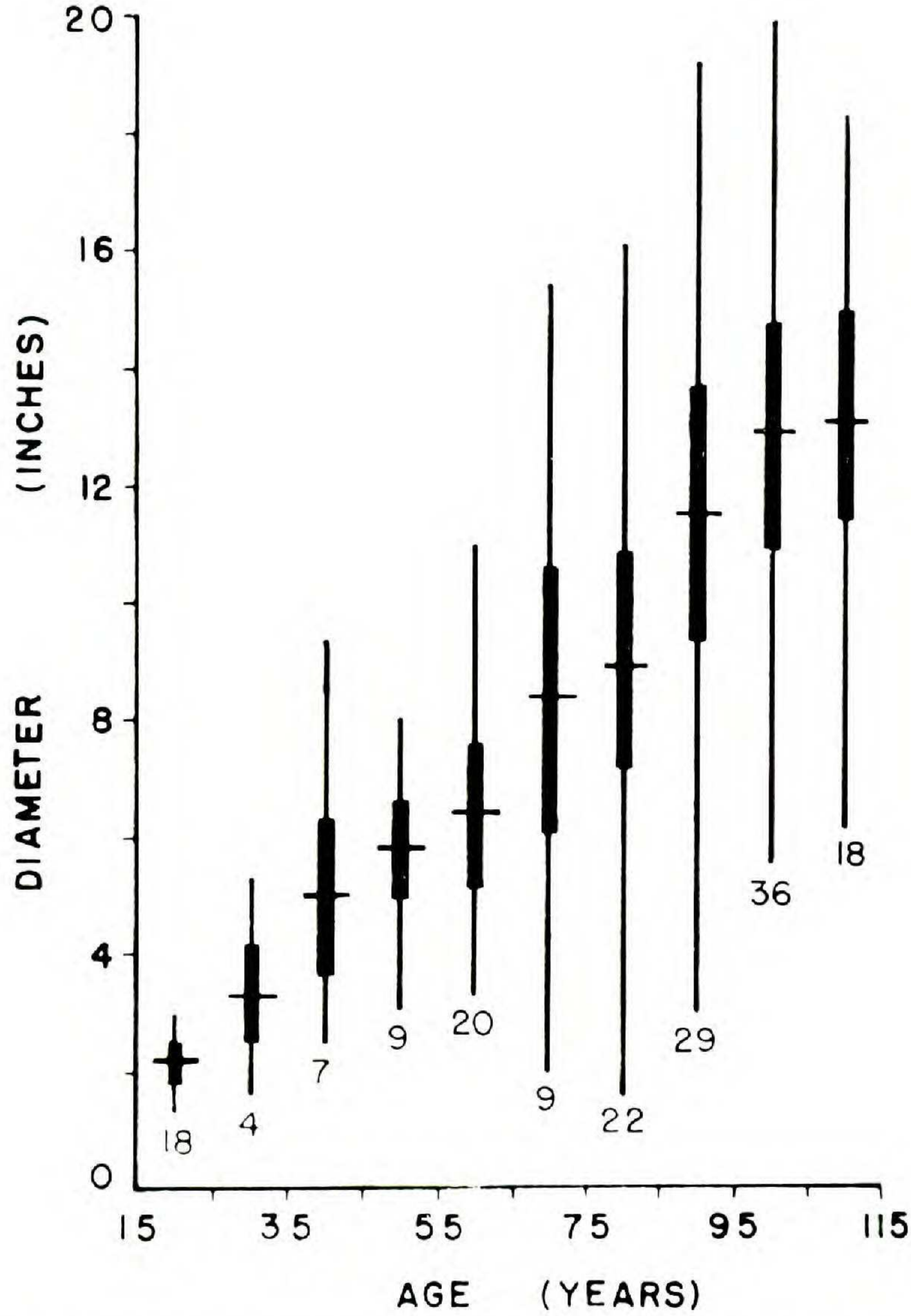

FIGURE 1. AGE-DIAMETERE RELATIONSHIP. The mean dbh in inches (cross line), 1 standard deviation of the mean (broad bar), and range (narrow bar) are given for each 10 yr. age-class (16-25, 26-35, etc.). The number of trees measured in each age-class is given beneath each bar.

or the position of each tree on a slope, or any combination of these factors. Both stands occupy several habitats of differing exposures and vegetational compositions, but no differences in growth between habitats was recorded.

An obvious increase in the rate of growth between the 76-85 and the 86-95 yr. age classes correlates with the time of lumbering. This is interpreted as release from suppression and suggests that the amount of light is the limiting factor significantly affecting growth.

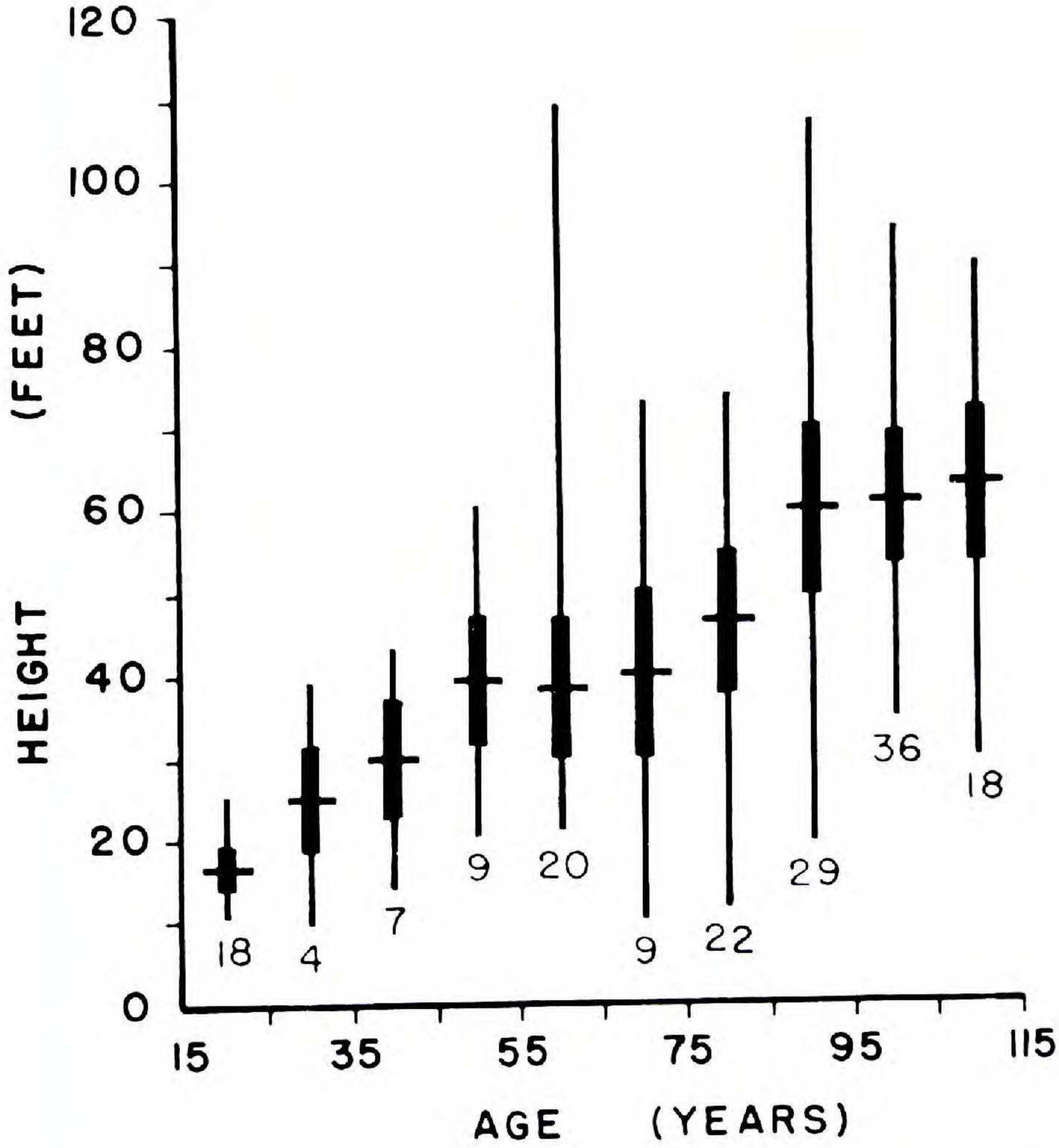

FIGURE 2. AGE-HEIGHT RELATIONSHIP. The mean height in feet (cross line), 1 standard deviation of the mean (broad bar), and range (narrow bar) are given for each 10 yr. age-class (16-25, 26-35, etc.). The number of trees measured in each age-class is given beneath each bar. Height, as determined by a pocket transit, may be underestimated by as much as 2 feet.

The average growth of the 2 stands studied is generally greater than that of hemlocks growing within the climax range of the species. These Ohio hemlocks grew in diameter slightly faster than those in a hemlock-beech stand in Pennsylvania (Morey 1936), 1.33 to 1.5 times as rapidly as those in a hemlock forest in Pennsylvania (Morey 1936), 1.33 times as fast as those in a virgin stand in North Carolina (Oosting and Bourdeau 1955), and 1.5 times as fast as those in a virgin stand in the lower peninsula of Michigan (Gates and Nichols 1930). In height the Ohio hemlocks grew approximately as fast as did hemlocks in Morey's (1936) hemlock-beech stand and .8 times as fast as in his hemlock stand.

Since the trees studied in Pennsylvania, North Carolina, and Michigan may have grown under different degrees of shading than the hemlocks of this study, these comparisons must be considered tentative. The data suggest that once hemlocks reach breast height, they do not suffer in their rate of growth for being outside of the climax range of the species.

I am grateful to Mr. H. S. Wagner for allowing this study to be made within Akron Metropolitan Parks and to Dr. R. W. Dexter of Kent State University, who directed this study which resulted in a master's thesis in 1957.

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